



Face masks effectively protect against Covid-19

A study shows that face masks are effective in lowering the reproductive number of Covid-19 and why their effectiveness differs in virus-poor and virus-rich air

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Corona medicine

'Don't forget your mask' - even if most people now make sure of this as a matter of course, there are different opinions even among experts about the effectiveness of face masks. An international team led by researchers from the Max Planck Institute for Chemistry in Mainz is now using observational data and model calculations to show under what conditions and how masks help reduce the individual risk of infection with Covid-19 and contain the corona pandemic. Accordingly, in most everyday situations, even a simple surgical mask is effective in reducing the risk. In environments with high levels of virus in the air,



Mostly effective protection: simple surgical masks effectively reduce the risk of infection with the Sars-CoV-2 coronavirus in most situations, as an international team led by researchers from the Max Planck Institute for Chemistry has now proven.

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Face masks are among the simplest, easiest to use, and most effective measures against airborne infectious respiratory diseases. Nevertheless, its effectiveness against the transmission of Sars-CoV-2 has been discussed and questioned many times. Some previous studies have shown that masks are ineffective under certain conditions. Others found it to be very effective. A coherent justification and clarification of the apparent contradictions have so far been missing.

Researchers from the Max Planck Institute for Chemistry, the University Medical Center of Johannes Gutenberg University Mainz and the Charité University Medical Center Berlin, together with partners from China and the USA, have now clarified how the effectiveness of face masks

depends on different environmental conditions has a population-wide impact on the course of the Covid 19 pandemic. To do this, they used a large number of observational data as well as a novel approach to calculating the average virus load and its distribution in the population.

Most of the time, even simple surgical masks are effective

"Usually only a small proportion of the droplets and aerosol particles exhaled by humans contain viruses. The virus concentration in the air is usually so low that even simple surgical masks are very effective in curbing the spread of Covid-19," explains Yafang Cheng, head of a Minerva research group at the Max Planck Institute for Chemistry. "Our approach allows detailed calculations of population mean values and explains why regions where a higher proportion of the population wears masks have the pandemic under better control."

In virus-rich indoor areas with a high probability of infection, however, masks with higher effectiveness (N95 / FFP2) and other protective equipment are required to prevent airborne transmission. Because the effectiveness of face masks strongly depends on the virus concentration, it is important to combine masks with other protective measures in order to keep the chances of infection low.

"The combination of high-quality masks with other protective measures such as ventilation and keeping a safe distance is particularly important for hospitals, medical centers and other indoor spaces where high-risk patients can encounter high virus concentrations," says Christian Witt, head of the pneumology research department at Charité - Universitätsmedizin Berlin. "Masks will remain an important protective measure against Sars-Cov-2 infections - even for vaccinated people, especially if the vaccination protection wears off over time."

The approach can be used to assess the protection against more infectious mutants

"Our method relates the effect of masks and other protective measures to the likelihood of infection and the number of reproductions. The approach and our results are applicable to a wide variety of respiratory viruses such as corona, rhino and influenza viruses and the corresponding diseases. They can also be used to assess the effectiveness against new and more infectious mutants of Sars-CoV-2," says Hang Su, research group leader at the Max Planck Institute for Chemistry. "Our study also explains why the aerosol transmission of viruses does not necessarily lead to the very high reproductive numbers that have been observed in measles. Even if the chances of infection and reproductive numbers are relatively low, the transmission of an infectious disease through the air cannot be ruled out. "

The study, now published in the science magazine Science, also shows that masks can only effectively reduce the number of reproductions for Covid-19 if as many people as possible use them correctly. In order to reduce the reproductive number from about three, as originally

observed, to less than one, at least 60 to 70 percent of people would have to use surgical masks correctly. With N95 / FFP2 masks it would be around 40 percent. With more infectious variants of Sars-CoV-2, the rates would have to be correspondingly higher.

"We are convinced that the mechanistic findings and quantitative results obtained in our study represent a scientific breakthrough that will help bring the debate about the usefulness of masks to a close and efficiently contain the Covid pandemic," summarizes Ulrich Pöschl, head of the department Multiphase chemistry at the Max Planck Institute for Chemistry in Mainz.

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additional Information

🔗 Corona risk calculator

The algorithm of the Max Planck Institute for Chemistry makes it possible to calculate the risk of infection for Covid-19 from aerosols indoors.

